



3.0 ENVIRONMENTAL CONSEQUENCES (*NEPA REQUIRED)

This chapter describes the environmental consequences associated with the alternatives for the nonstructural Hurricane and Storm Damage Risk Reduction (HSDRR) NED plans and the ecosystem restoration NER plans. The impacts of the NED plans described here are programmatic in nature. Subsequent NEPA documents will analyze in detail site specific NED project(s) impacts prior to implementation. The impacts of the NER plan features described herein and in Appendix A are assessed at a full feasibility-level to be recommended for construction. Fact sheets for the NER features can be found in Appendix K.

3.1 The Human Environment

The following evaluation of impacts to the human environment does not include those that would be associated with large-scale acquisition of properties associated with implementation of the NED plan. Acquisitions of this magnitude, although not contemplated at this time, could have significant impacts in each of the socioeconomic resource areas covered in this section. Changes to the impacts analysis made necessary by ongoing development of the NED implementation plan will be addressed prior to implementation in future NEPA documents. Therefore, the conclusions contained herein as it relates to the NED plan, are subject to change pending the development of further information with respect to the scale of potential acquisitions. In absence of this information a qualitative evaluation in a worst case scenario will be developed as part of further refinement of the programmatic EIS.

3.1.1 Population and Housing

HSDRR (NED) Plan

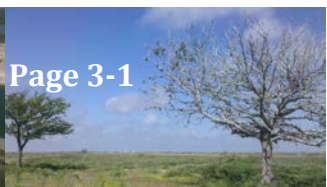
Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Direct impacts include the potential for damage to structures, landscaping and driveways while the structure is being elevated. There would also be potential inconvenience to residents having to move and store their personal possessions and relocate to a temporary residence while their residences are being elevated as well as impede access to the residence during the time the residence is being elevated. Temporary relocation of individuals and families could entail different travel routes through unfamiliar areas, longer commute times to work, school, and other destinations for typical life activities (e.g., shopping, doctor and dentist visits, etc.). The change in commute times could be a positive or negative impact, since the relocation could temporarily move individuals and families either closer or farther away from their destinations. The scope of the acquisition component is unknown, but would result in a displacement of persons, voluntary or not. Displacement would not likely result in a net change of population to the study area, but could result in changes to the populations of individual communities and neighborhoods within and potentially outside the study area. Furthermore, displaced residents could experience different and longer routes travel routes through unfamiliar areas, longer commute times to work, school, and other destinations for typical life activities (e.g., shopping, doctor and dentist visits, etc.).

Indirect Impacts would include reduced flood risk from the surges associated with tropical events for population and housing in the 25-year floodplain of the study area. The reduction in flood risk would lead to greater stability and sustainability of population and housing resources. However, if a residence is elevated, access to the elevated residences could be more difficult, especially for the elderly and physically handicapped, even if retrofitted with elevator and other devices. Additional indirect impacts would be the different visual appearance of neighborhoods and communities with a few elevated structures located within a community of nearby structures that are not elevated. There could also be a potential drainage issues, especially related to construction of berms. There is also a potential that existing landscaping around residential structures could be damaged and require restoration.

Alternative – Nonstructural 100-year Floodplain (Plan 8)

The impacts from this alternative are similar but for the most part greater than the impacts from the Nonstructural 0-25 Year Floodplain Plan (TSP) alternative because of the larger numbers of structures that would be included in the program. This is true for all resources hence a discussion of impacts will not be added to each of the following resource unless there is a significant reason for it to be addressed separately in that resource. The scale of the differences would vary by resource.



**Ecosystem Restoration (NER) Plans**Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Restoration features would have no direct impacts on population and housing. Indirect impacts would include decreasing the rate of shoreline erosion, thereby, preserving the temporary population of the Holly Beach camp community located along the shoreline of the Gulf of Mexico in the Calcasieu Basin.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the Mermentau Basin (MB) component of the TSP.

3.1.2 Employment, Business, and Industrial Activity (Including Agriculture)**HSDRR (NED) Plans**Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

There would be direct impacts associated with the flood proofing of businesses and the construction of berms in the nonstructural plan. If commercial structures are flood proofed, businesses could potentially either shut down or relocate temporarily while the measure is being applied, which could lead to a loss of revenue, change in business clients to other more available businesses, as well as a loss of wages to employees. Also, the construction of berms around warehouses could temporarily and intermittently impede access to the warehouses during construction and cause drainage issues for adjacent areas and structures. There is a potential that existing landscaping around businesses and warehouses could be damaged and require restoration. The scope of acquisitions for commercial structures is currently unknown. There may not be any such structures that meet the criteria for acquisitions. In the event that a commercial structure is acquired, it is possible that the business could choose to cease operations, resulting in the loss of jobs that it provided, thereby adversely affecting employment in the area. Also, if a business relocates outside of the community, it could face the inconvenience of having to establish itself in a new area as well as longer travel distances and increased transportation costs to move the business products to markets. This inconvenience could take the form of a marketing campaign to raise awareness of the new location, which could result in an expense to the business over and above what would normally be spent. Also, some businesses could relocate beyond what some employees would consider an acceptable commuting distance. This impact could reduce employment or redistribute it, depending on whether these workers find other employment. Furthermore, customers could face the inconvenience of longer commute times and distances if a business they patronize either closes or relocates.

Indirect Impacts would include reduced flood risk from the surges associated with tropical events for employment, business, and industrial activity in the 25-year floodplain of the study area. Also, some businesses could potentially lose customers as a result of residents relocating farther away due to their homes being acquired, while other businesses could gain customers as residents relocate closer to them.

Ecosystem Restoration (NER) PlansAlternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Restoration features would have no direct or indirect impacts on employment, business, and industrial activity.

Alternative - Mermentau Small Integrated Restoration Plan

Impacts are the same as the MB component of the TSP.

3.1.3 Public Facilities and Services**HSDRR (NED) Plans**Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

There would be direct impacts associated with nonstructural alternative for the public facilities and services in the area. If public facilities are flood proofed by the government, then public services could be interrupted as they close or are relocated to temporary locations. Public facilities are not within the scope of potential acquisitions, unless life safety issues are found.



Indirect impacts for the nonstructural alternative would include reduced flood risk from the surges associated with tropical events for public facilities and services located in the 25-year floodplain of the study area. Also, due to the relocations of residents due to the acquisitions of homes, some public schools could gain students, while others could lose students. Other direct and indirect impacts would be similar to those described in sections 3.1.1 and 3.1.2.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Restoration features would have no direct, indirect, or cumulative impacts on public facilities or services.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as MB component of the TSP.

3.1.4 Transportation

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Direct impacts associated with the nonstructural alternative for transportation would include temporary and intermittent delays, disruption of traffic movement, congestion of roads, re-routing of vehicles and pedestrians. Local parking access to businesses could also be affected by construction vehicles and crews.

Indirect impacts would include the additional wear and tear on roads, especially local roads, caused by large trucks transporting construction materials, as well as reduced parking. There would also be greater noise and dust generated by construction vehicles. However, best construction management practices would be utilized to ensure the safety of construction workers, residents, and employees during construction of the non-structural alternatives.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

There would be no direct impacts on transportation. Indirect impacts would include the additional wear and tear on roads, especially local roads, caused by large trucks transporting construction materials. Also, impacts include mitigating the wave action that Highway 27 is routinely subject to, thereby reducing the frequency and intensity of the damages it sustains.

Alternative - Mermentau Small Integrated Restoration Plan

Impacts are the same as the MB component of the TSP.

3.1.5 Community and Regional Growth

HSDRR (NED) Plan

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Direct impacts would include a temporary monetary stimulus to the region due to spending associated with the construction activities in the area. This stimulus would be temporary but increase the region's income for as long as the spending continued. Also, some communities within the study area could gain residents as a result of relocations resulting from acquisitions, while other communities could lose some residents. For the study area as a whole, relocations would likely take place within the overall study area, resulting in little if any change.

Indirect impacts would include reduced flood risk for those low-lying structures within communities from the surges associated with tropical events, thus preserving growth opportunities for communities in the region.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)



Restoration features of this alternative would have no direct or indirect impacts on community and regional growth other than the temporary monetary stimulus associated with construction activities, as described for the NED plan.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as MB component of the TSP.

3.1.6 Tax Revenues and Property Values

HSDRR (NED) Plan

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

For the nonstructural plan, parish sales tax revenue would likely increase during the implementation of nonstructural measures as a result of the influx of workers from outside of the study area. Also, the acquisition and demolition of structures would decrease the property tax base of the cities and parishes in which they are located.

Indirect impacts could include an increase in tax revenue and property values due to the increased risk reduction from flooding for residential properties and businesses in the 25-year floodplain.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

There would be no direct effects to tax revenues and property taxes with this alternative. Indirect effects would include the prevention of land loss, which could result in localized positive effects of maintaining tax revenues and property values.

Alternative - Mermentau Small Integrated Restoration Plan

Impacts are the same as the MB component of the TSP.

3.1.7 Other Social Effects (OSE)

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

A summary of OSE is presented in the Table 3-1. These include reduction in risks associated with damages from tropical/hurricane storm surge events to housing units, public facilities, and commercial structures located within reaches where the TSP is implemented, as well as improvement in the health and safety of those residents living within these and surrounding areas. Depending on participation rates, the overall social vulnerability of all three parishes could be reduced, and thus, the potential for long-term growth and sustainability could be enhanced. These areas would be at a reduced risk of incurring costs associated with clean-up, debris removal, and building and infrastructure repair as a result of flood events.

Table 3-1: Summary of Other Social Effects.

OSE Alternative Evaluation				
Social Factors and Metrics	Nonstructural Measures	CM-4	M4	No Action
	DL / FE	DL / FE	DL / FE	DL / FE
Physical Health/Safety	1/2	1/1	0/0	-1/-2
Regional Healthcare	1/2	1/1	0/0	0/-2
Employment Opportunities	1/3	0/0	0/0	-1/-3
Community Cohesion	1/2	0/0	0/0	-1/-1
Vulnerable Groups	1/1	1/1	0/0	-1/-2



Residents of Study Area	1/1	1/1	0/0	-1/-2
Recreational Activities	1/2	1/2	0/1	-1/-2
Impacts are in comparison to the Without Project Condition DL = impacts to daily life when there is no storm/flooding FE = impacts during a storm/flood event Scores range from -3 (significant negative impact) to +3 (significant positive impact)				

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

This alternative would reduce the risks associated with habitat damage via saltwater intrusion, shoreline retreat, and loss of geomorphologic infrastructure. The area's social vulnerability would be reduced under this alternative via improved leisure and recreation opportunities, access to health and safety facilities, economic vitality, and reduced stress. Thus, the potential for long-term growth and sustainability would be enhanced.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4) Impacts are the same as the MB component of the TSP.

3.1.8 Community Cohesion

HSDRR (NED) Plan

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Direct impacts that would disrupt community cohesion, temporarily, include the noise and fugitive dust from construction activities, the temporary displacement and relocation of residents during construction, and disruption of businesses during construction. Furthermore, non-residential structures that serve as meeting places for the community could become temporarily unavailable during the floodproofing process. Residents whose homes are acquired either on a voluntary or involuntary basis could permanently relocate outside of their community, thereby disrupting the resident's "sense of belonging" to their neighborhood, their level of commitment to the community, and their attachment to their neighbors, groups and institutions due to the greater traveling time and distance and their ability or willingness to engage in the same patterns of social interactions in the community that prevailed before the acquisitions occurred.

Indirect impacts for the nonstructural plan would include reduced flood risk for lower-lying structures within communities from the surges associated with tropical events, thus preserving community cohesion in the region. Other indirect impacts include changes to pedestrian and handicap access not only to homes, but also to community facilities affected by non-structural alternatives.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

There would be no direct impacts on community cohesion. Indirect impacts would include maintaining the integrity of the coastal landscape that supports ecosystem services that in turn supports human population and activities.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the MB component of the TSP.

3.1.9 Environmental Justice

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

An environmental justice (EJ) analysis was conducted which focused on the potential for disproportionately high and adverse impacts to minority and low-income populations during the construction and normal operation of the proposed risk-reduction system. Environmental Justice communities, as defined by minority composition and percent of population existing at or below the federal poverty level, have been identified within the project area.



As discussed in greater detail in Appendix A, Annex O, low-income and minority populations within the project area were assessed using up-to-date economic statistics, aerial photographs and U.S. Census Bureau 2007-2011 American Community Survey (ACS) estimates. The potential impacts to minority and low income populations would be similar to those identified in the project area. In light of the presence of EJ communities in the project area, as the NED implementation process is further assessed, prior to implementation, additional EJ-related analysis will be performed to ensure adequate consideration of the potential for EJ-related impacts across the project area.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Many of the areas are sparsely populated or devoid of permanent structures and/or population. Construction of control structures to reduce saltwater intrusion and tidal influx would temporarily impact leisure and recreation at any nearby camps or designated fishing and hunting spots. Access to some areas due to marsh restoration and nourishment activities may be temporarily interrupted. Impacts due to shoreline protection construction would also be temporary. The long-term benefits of salinity control, marsh restoration, shoreline protection, bank stabilization, and chenier reforestation would improve wetland habitat which would subsequently improve leisure and recreation opportunities. If this alternative encourages regional economic growth, any additional jobs created may benefit minority and/or low-income groups living within the project area. Temporary impacts from construction activities due to increased turbidity, noise, and access interruption are compensated for by the opportunity for long-term positive cumulative impacts as other restoration programs improve the habitat and sustainability of coastal Louisiana.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the MB component of the TSP.

3.2 Water Environment (Hydrology and Hydraulics)

3.2.1 Flow and Water Levels

HSDRR (NED) Plan

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Potential direct and indirect impacts to flow and water depend on the method used.

1. Raising structures with pilings or buyout could increase storage capacity and lower surge elevations for those structures not elevated.
2. Raising structures with earthen mounds, floodproofing, or individual berms could decrease storage capacity and raise the surge elevations for those structures that are not elevated.
3. Raising structures with a cinderblock chain wall would have similar impacts as existing conditions on storage capacity and surge elevations since it would mimic existing conditions of the structure.

The total level of impact would be relatively minor and would be dependent on the combination of non-structural methods used and the participation rate in the program

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: General flow patterns would not change.
- *Marsh Restoration*: Existing water in fragmented marsh and shallow open water areas would be converted to marsh habitat. This change would not cause water levels in adjacent lakes to change. Flows would generally overflow restored and nourished marsh areas without major changes.
- *Shoreline Protection*: Segmented breakwaters along the Gulf would dissipate the high energy Gulf waves without changing water levels or flows. Rather, these structures would provide conditions conducive to land building behind them. Interior shoreline protection measures will not alter flows or water levels. Rather, these structures will reduce erosion caused by waves.
- *Cheniers*: No direct or indirect impacts.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as MB component of TSP.

3.2.2 Water Quality and Salinity**HSDRR (NED) Plans**Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Direct impacts would primarily be associated with construction for the raising and flood-proofing of structures, as well as construction of small berms around warehouses. Construction impacts to runoff would be minimized through implementation of a Stormwater Pollution Prevention Plan (SWPPP) (USEPA 2012).

Indirect Impacts: Raising and flood-proofing of structures, as well as protecting warehouses with berms, would prevent their being flooded, which would reduce water quality impacts with comparison to future without project conditions.

Indirect impacts include raising and flood-proofing of structures, as well as protecting warehouses with berms, would prevent their being flooded, which would reduce water quality impacts with comparison to future without project conditions.

Ecosystem Restoration (NER) PlansAlternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Direct impacts of ecosystem restoration features would convert existing open water, wetland, and low-quality chenier habitat to marsh, improved chenier habitat, hydrologic/salinity control, and shoreline protection features. Because rock, fill, and construction materials for proposed hydrologic/salinity control and shoreline protection features are anticipated to be free of contaminants, discharge of these materials into existing adjacent waters would not be expected to result in adverse effects to aquatic organisms. Material proposed for construction of marsh and chenier restoration features would be evaluated to determine suitability for placement in the aquatic environment in accordance with Clean Water Act Section 404(b)(1).

Indirect impacts of ecosystem restoration features could lead to water quality improvements through the restoration and protection of wetland and chenier habitat. The hydrologic/salinity control feature is expected to aid in reducing salinities in Cameron Parish, the benefits of which are largely unknown, as area wetlands have likely adapted to existing salinity patterns. The feature may also contribute to salinity stratification, similar to the MRGO closure (Swarzenski et al. 2013, in preparation).

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the MB component of the TSP.

3.3 Natural Environment**3.3.1 Sedimentation and Erosion****HSDRR (NED) Plans**Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

There would be no direct or indirect impacts.

Ecosystem Restoration (NER) PlansAlternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity:* Hydro/salinity measure Calcasieu/Sabine Basin (CB) #74a is proposed as a spillway structure on the east side of Calcasieu Lake. The proposed action would evacuate storm surge from wetlands behind the Cameron-Creole levee. The measure would not be used to manage daily tidal exchange from Calcasieu Lake. The structure dimensions are 204 feet wide by 600 feet in length, and would directly impact approximately 3 acres of water bottoms in Calcasieu Lake. Sediment transport at the salinity control structure site would likely remain unaffected, as it would only be operational during storm surge events for

increased drainage capacity for the Cameron-Creole Watershed. This would not affect sediment delivery to the coast. This water control structure would likely lead to minimal local reduced water levels landward of the Cameron-Creole levee through improved drainage from storm surge. The rock lining in the outfall channel would minimize increased erosion from operation.

- *Marsh Restoration*: Increased marsh surface area would increase sediment entrapment when marshes are flooded (e.g., tidal and storm surge). Restored marsh would reduce fetch over open water areas thereby reducing wind generated waves and subsequent erosion.
- *Shoreline Protection*: Sedimentation patterns in the vicinity of the features would be altered. Sediment deposition and/or erosion would occur depending on the hydrodynamics at the site. For example, the location and orientation of individual features could cause erosion and/or sediment accretion. Shoreline erosion adjacent to the features would likely be reduced. Longshore sediment transport in the vicinity of the shoreline protection features in the Gulf of Mexico may result in the accumulation of sediment behind breakwater features, creating groins or tombolos.
- *Cheniers*: Tree roots bind sediments together and would likely reduce erosion of cheniers if they are overtopped in storms or by relative sea level rise.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)
Impacts are the same as the MB component of the TSP.

3.3.2 Soils, Water Bottoms, and Prime and Unique Farmlands
HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Nonstructural components would have no direct impacts on soils, prime and unique farmlands, or water bottoms. However, a beneficial indirect impact through potential property acquisition could result in soils being returned to “green space” and soils that are prime and unique farmlands could become available for agriculture and pastureland (i.e., structures, including slab foundations, would be removed from the area).

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: Hydro/salinity measure Calcasieu/Sabine Basin (CB) #74a is proposed as a spillway structure on the east side of Calcasieu Lake. The proposed action would evacuate storm surge from wetlands behind the Cameron-Creole levee. The measure would not be used to manage daily tidal exchange from Calcasieu Lake. The structure dimensions are 204 feet wide by 1,509 feet long, and would directly impact approximately 3 acres of water bottoms in Calcasieu Lake. The dredging of a floatation canal would directly impact 104 acres of water bottoms, but the impacts would be temporary as the canals would be refilled at the completion of use in accordance with standard best management practices.. Bancker and Clovelly muck hydric soils are most common in the wetlands behind the Cameron-Creole levee, as well as along the East Calcasieu Lake shore. The use of the proposed spillway channel to control or remove storm surge from the wetlands could slow or prevent further erosion and provide a beneficial impact to hydric soils and wetlands adjacent to East Calcasieu Lake. The closest identified soils to East Calcasieu Lake and the proposed H/S #74a measure that are classified as prime farmlands consist primarily of Hackberry loamy fine sand (Hb) and Judice silty clay loam (Ju) on chenier ridge tops. Prime farmlands would not be directly impacted by the construction or use of the spillway channel, but could benefit indirectly by the prevention of future soil and land losses attributed to storm surges.
- *Marsh Restoration*: would include the beneficial use of dredged material from the Calcasieu Ship Channel and the Gulf of Mexico (Gulf) for the restoration and nourishment of marsh. Hydric soils in the marsh restoration areas consist primarily of Bancker muck, Creole mucky clay, Scatlake mucky clay, Larose mucky clay; and less frequently Allemands mucky peat, Clovelly muck, and Mermentau clay (Table 3-2).

Table 3-2: Hydric soils in marsh restoration areas.

Soil Association	Acres
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Allemands mucky peat (AE)	40
Bancker muck (BA)	4,747
Clovelly muck (CO)	142
Creole mucky clay (CR)	3,481
Larose mucky clay (LR)	503
Mermentau clay (MM and ME)	24
Scatlake mucky clay (SC)	1,327

Impacts to hydric soils from the restoration and nourishment of marsh would be beneficial. As marsh is restored, hydric soils would increase and become more stable. Soils associated with prime and unique farmlands are most common on chenier ridges, and none of these soils were identified in the marsh restoration areas. There would be no direct impacts to prime and unique farmlands as a result of the restoration and nourishment of marsh areas. The restoration and nourishment of marsh could result in an indirect impact that could be beneficial to soils identified as prime and unique farmlands. The restoration of marsh would contribute to flood attenuation from small storm events and could prevent future loss of prime and unique farmland soils that may be present on nearby chenier ridges. Direct impacts to water bottoms in the marsh restoration footprints (Calcasieu Basin over 6,000 acres and Mermantau Basin over almost 6,550 acres created or nourished), containment dikes, flotation canals and borrow areas would result in the loss of existing bottom habitat. The containment dikes would naturally degrade over time, resulting in the temporary loss of approximately 359 acres of bottom habitat. Borrow areas to provide sediment for the restoration and nourishment of the marsh areas would result in direct impacts to approximately 7,000 acres of bottom habitat. Table 2-18 (Chapter 2) provides a full listing of each feature with total quantities of impacts to bottom habitat..

- Shoreline Protection:* The 5a: Holly Beach Shoreline Stabilization – Breakwaters measure would include placement of rock breakwaters, resulting in direct impacts to approximately 46,000 linear feet of water bottoms in the Gulf of Mexico. The Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou measures would be constructed in three segments (6b1, 6b2, and 6b3), resulting in direct impacts to approximately 139,400 linear feet of water bottoms in the Gulf of Mexico. Measure 16b: Fortify Spoil Banks of GIWW and Freshwater Bayou would consist of bankline protection with rock dikes along three separate reaches of Freshwater Bayou, resulting in direct impacts to approximately 81,500 linear feet of water bottoms in Freshwater Bayou. In all shoreline protection measures, soft surface water bottoms would be replaced with rock resulting in indirect impacts to aquatic habitat along the shorelines. Hydric soils could be directly impacted during the placement of stone breakwaters and rock dikes, but long term indirect impacts would include the prevention of further erosion and loss of these soils, and potentially an increase in hydric soils along the Gulf shoreline. Soils associated with prime and unique farmlands are most common on chenier ridges, and none of these soils were identified in the vicinity of the Gulf shoreline restoration or Freshwater Bayou features. Approximately 549 acres of Hackberry loamy fine sand, classified as a prime farmland soil, is located along the shoreline adjacent to the Holly Beach shoreline stabilization feature. The 549 acres of prime farmland soils along the shoreline at Holly Beach would not be directly impacted by the placement of the rock breakwaters, nor would any other prime and unique farmlands be directly impacted or removed from agriculture use by the shoreline protection feature of the TSP. Indirect impacts to the 549 acres of Hackberry loamy fine sand resulting from the shoreline stabilization feature at Holly Beach would include a reduction in erosion and loss of the prime farmlands. Over time, tomobolo or sandbars could form between the breakwaters and existing beach resulting in the direct conversion of water bottom habitat. The dredging of flotation canals and associated disposal areas would result in temporary direct impacts to 4,042 acres of bottom habitat. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- Cheniers:* A total of 578 acres of hydric soils were identified along the cheniers. Reforestation of the cheniers would stabilize soils and could prevent future erosion and loss of hydric soils. Therefore, the direct and indirect impacts to hydric soils on the cheniers would be beneficial. No water bottoms were identified on the cheniers, so there would be no direct or indirect impacts to water bottoms as a result of chenier reforestation. Soils that are suitable for agriculture and pastureland in the Chenier Plains are most commonly located on the chenier ridges. Approximately 514 acres of soils classified as prime farmlands,



consisting entirely of Hackberry loamy fine sand, are present along the chenier ridges that are proposed for reforestation under this alternative. The reforestation of the chenier ridges would remove these areas and identified prime farmlands from future agricultural use. In compliance with the Farmland Protection Policy Act (FPPA), the USACE consulted with the Department of Agriculture – Natural Resources Conservation Service (NRCS) to determine the precise acreage of prime and unique farmlands that would be impacted. It was determined that the proposed activities would not irreversibly impact prime farmlands and is exempt from the rules and regulations of the FPPA, Subtitle I of Title XV, Section 1539 – 1549 (NRCS letter dated December 13, 2013). An additional positive impact resulting from the chenier restoration measure is the stabilization of soils in the cheniers. This impact would indirectly benefit water bottom habitat through the reduction of sedimentation, as less material would be washing into the water column. Table 2-18 (Chapter 2) provides a full listing of feature quantities.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the MB part of the TSP.

3.3.3 Coastal Shorelines

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

No impacts as the NED areas are located far removed from the Gulf coastal shoreline.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: No impacts.
- *Marsh Restoration*: Only measure 124c: Marsh Creation at Mud Lake would occur in proximity to the Gulf shoreline. Construction of this measure would require dredged material to be pumped across the shoreline from the Gulf borrow site to the marsh restoration sites resulting in only temporary and minor disturbance to the shoreline resources expected from this construction activity.
- *Shoreline Protection*: Proposed segmented breakwaters are expected to eliminate or substantially reduce erosion of the gulf shoreline, but would not directly affect hydrology or salinity levels since the openings between the breakwater segments would allow free passage of water. Indirectly, the breakwaters would maintain existing salinity and hydrology in the marshes and water bodies behind the shoreline, which could otherwise be altered by continued erosion. In the MB there are numerous canals and natural bayous and ponds that lie behind the gulf shoreline. Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou measures (6b1, 6b2, and 6b3) would prevent new openings from forming between the Gulf and these water bodies.
- *Cheniers*: Several of the chenier restoration projects would occur in close proximity to the Gulf shoreline. It is possible that some construction equipment may be delivered by barge from the Gulf to access the chenier ridges to perform restoration activities. In such cases, there would be minor, localized, temporary adverse impacts, including loss of vegetation cover and displacement of shoreline sediments.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Direct and Indirect Impacts: Impacts same as MB impacts of TSP.

3.3.4 Vegetation Resources

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

The area identified as the nonstructural component of the TSP would not significantly impact existing vegetation resources as any construction would be to previously disturbed areas. There is a risk that specific methods at specific locations could impact wetlands on that site but these methods and locations combinations would be avoided where practicable.

Ecosystem Restoration (NER) Plans



Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

The TSP would restore/nourish/protect a total of about 7,315 acres in the CB; and 16,868 acres in the MB. See Table 2-18a-d for all quantities related to TSP.

- *Hydro/Salinity*: Measure #74a in the CB. The Master Plan model used to evaluate measure #74a needs additional refinement to properly evaluate the benefits over the 6,651-acre area of influence. The modeling indicated a slight decrease in acreage under the FWP condition (0.8 % reduction), but indicated a positive benefit in habitat quality (267 AAHU). Therefore it would be prudent to examine this measure in more detail as the study progresses. Since the net benefit is an overall increase in habitat quality, no mitigation is proposed at this time, until more detailed modeling can be conducted. The measure would indirectly benefit vegetation by reducing the exposure to higher salinity waters associated with storm surge that overtops the Cameron-Creole levee, thereby providing for a more stable system.
- *Marsh Restoration*: These measures would restore and/or nourish a net total of 8,714 acres overall, with approximately 1,915 acres of saline marsh and 2,073 acres of brackish marsh in the CB and 4,726 acres of brackish marsh in the MB. Of these totals approximately 9 acres of saline marsh and 10 acres of brackish marsh would be impacted in the CB, and approximately 67 acres of brackish marsh would temporarily be impacted in the MB from access required for borrow deposition. Restored/nourished marsh would regenerate and revegetate naturally from seed sources and vegetative sources in the area and contribute to reducing the overall habitat fragmentation in the area as well as provide many different species of fish and wildlife with shelter, nesting, feeding, roosting, cover, nursery, and other life requirements habitat. These marsh habitats would also provide neotropical migrants with essential staging and stopover habitat (after Stoffer and Zoller 2004, Zoller 2004). Based on previous coastal restoration actions, it is expected that invasive species would not occur on restored coastal marsh platforms unless the elevation of the marsh platform is too high (i.e., upland-like conditions). Implementation of hydro/salinity measures could result in a conversion of some existing marsh types to a fresher marsh type over time. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Shoreline Protection*: These measures would protect a net total of 5,509 overall with approximately 26 acres of barrier island habitat in the CB, and 4,847 acres of saline marsh and 662 acres of brackish marsh in the MB. These shoreline protection measures would restore an important geomorphic framework for preventing further fragmentation and loss of interior wetlands used as habitat by many different species of fish and wildlife. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Cheniers*: Measures would reforest chenier forests and improve a net total of 1,413 acres overall with 1,131 acres of reforested habitat in the CB and 282 acres of reforested habitat in MB. The proposed reforestation would provide critical stopover habitat for migratory neotropical birds. Typical invasive plants that may be eliminated or controlled but are not limited to this list are Chinese tallow, Chinese privet, cogon grass, Johnsongrass, Japanese privet, Japanese honeysuckle, common ragweed, rescuegrass, sticky chickweed, purple nutsedge, and mimosa trees. However, invasive species are presently limited on the cheniers due to ongoing farming activities. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4) Impacts are the same as the MB component of the TSP.

3.3.5 Wildlife Resources

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

No significant impacts on most wildlife resources except for human commensal wildlife (e.g., rats, mice, pigeons, etc.) that thrive in association with human habitations, which typically disrupt the natural habitats. There could be benefits to wildlife if enough structures on land contiguous with each other were bought out and allowed to return to a natural state and if that area was contiguous with an adjacent wildlife corridor.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)



- *Hydro/Salinity*: The loss of fresh marsh attributed to salinity intrusion from daily tidal movement as projected within areas controlled by the proposed structure (measure 74a) would be reduced, helping to preserve the existing marsh in the area and the wildlife populations dependent on this habitat type. This measure would result in the preservation of habitat for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. No adverse impacts to wildlife are anticipated from installation of this structure.
- *Marsh Restoration*: Approximately 2,523 acres of open water would be converted to brackish marsh, and 1,908 acres to saline marsh in the CB, and approximately 4,148 acres of open water would be converted to brackish marsh in the MB. Additional nourishment could occur adjacent to the marsh restoration sites. The proposed restoration/nourishment in these basins would result in improved habitat conditions for several species of wildlife including migratory and resident waterfowl, shorebirds, wading birds, and furbearers. Migratory waterfowl utilizing the area would benefit from a greater food supply resulting from the increased abundance and diversity of emergent and submerged species. Habitat for the resident mottled duck would also improve considerably as the marsh platform would provide more desirable nesting habitat. Intertidal marsh and marsh edge would also provide increased foraging opportunities for shorebirds and wading birds. Small fishes and crustaceans are often found in greater densities along vegetated marsh edge (Castellanos and Rozas 2001, Rozas and Minello 2001), and many of those species are important prey items for wading birds such as the great blue heron, little blue heron, great egret, black-crowned night-heron, and snowy egret. Mudflats and shallow water habitat restored by the deposition of dredged material would provide increased foraging opportunities for shorebirds such as least sandpipers, killdeer, and the American avocet. Those species feed on tiny invertebrates and crustaceans found on mudflats which are exposed at low tide and in shallow-water areas of the appropriate depth. Furbearers (such as nutria and muskrat) which feed on vegetation would benefit from the increased marsh acreage in the project area. Representative furbearers such as the mink, river otter, and raccoon have a diverse diet and feed on many different species of fishes and crustaceans. Those species often feed along vegetated shorelines which provide cover for many of their prey species. The loss of open water habitat with construction of these features would not be expected to adversely affect species that currently utilize these habitats as there is ample open water habitat in the basins. Wildlife species currently utilizing the shallow open water and vegetated shorelines in the project area are highly mobile and/or suited to semi-aquatic life and should not be affected during construction. Measures for reducing entrapment of sea turtles and Gulf sturgeon would be implemented. These measures can be found in Appendix A and no indirect impacts are anticipated. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Shoreline Protection*: The installation of 180,545 linear ft of segmented offshore breakwaters and about 71,000 linear ft of rock revetment would work to protect the marshes behind these structures from wave induced erosion and help maintain wildlife populations dependent on this habitat type. Some existing wildlife habitat would be converted to rock revetment habitat thereby reducing the available wetland habitat for wildlife species and also resulting in the demise of more immobile wildlife species. However, these impacts would result in a minimal overall impact to wildlife populations in the area and would work to protect the adjacent habitat these species depend on for survival that could be lost in the future if the revetment was not installed. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Cheniers*: Approximately 1,132 acres of existing chenier habitat in the CB and 282 acres of existing chenier habitat in the MB would undergo invasive species control and reforestation with construction of the proposed action. Implementation of these measures would increase the diversity of the existing habitat and the quality of the available foraging, resting and nesting habitat necessary for numerous terrestrial and avian wildlife species and essential for neotropical migrants. Construction would be minimally invasive (no earthwork is required) and some species may temporarily avoid these project features during construction, but would quickly return once construction is complete. Table 2-18 (Chapter 2) provides a full listing of feature quantities.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts to wildlife resources would be similar to those discussed for the NER TSP except to a lesser extent.



3.3.6 Fisheries and Aquatic Resources

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

The nonstructural features should have no impact to these resources depending on the methods used. Direct and indirect impacts to these resources will be refined when the actual method of nonstructural and number of structures are examined in future NEPA documents.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity:* The CB component (#74a) as presently described would convert approximately 3 acres of open water benthic habitat and 0.25 acres of marsh into a rock structure, part of this structure would be out of the water and would be completely unavailable for fisheries use. The majority of the open water area is now listed as public oyster seed ground. Direct effects on benthic habitat from the measure includes covering and smothering of benthic organisms including oysters by the placement of rock. There would be a short term direct adverse impact to benthic species as well as the habitat of other aquatic species as 104 acres of water bottom is deepened and then refilled for the floatation channels. There could be direct mortality or injury of fisheries and benthic species due to both the digging and relocating of the material and burial of species that have colonized the area during the work. During construction of project features, there would be short-term indirect adverse impacts to plankton, benthic populations and fisheries species due to increases in turbidity, low dissolved oxygen, and introduction of sediments into shallow open water areas. Filter feeding species would be impacted due to clogging of the gills which could either cause death or reduce growth and reproduction. Visual predators would have a reduced success rate due to turbidity. Mobile species would attempt to move from the area of influence.
- *Marsh Restoration:* Impacts in the construction footprint (CB over 6,000 acres and MB over 6,500 acres restored or nourished), and construction activities using earthen materials to create wetland could include the elimination of benthic and fishery habitat. There also could be direct mortality or injury of fisheries and benthic species due to burial or increased turbidity. Approximately 8,390 acres are identified for borrow (831 acres from Calcasieu Ship Channel, 6,197 acres from the Gulf) which would cause the conversion of shallow open water habitats to less valuable deep water borrow areas. Depending on the depth of the borrow area, this deeper water habitat could provide a refuge during extreme water temperature spikes. In addition there would be a short term direct adverse impact to benthic species as well as the habitat of other aquatic species as 955 acres of water bottom is deepened and then refilled for the floatation channels. There could be direct mortality or injury of fisheries and benthic species due to both the digging and relocating of the material and burial of species that have colonized the area during the work. Improved marsh habitats and increased SAV could have positive indirect impacts on juvenile fishes, shrimp, crabs, and other species by increasing food and cover if they are able to access the area. The conversion of open water to marsh is generally considered a benefit to aquatic species. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Shoreline Protection:* Impacts in the construction footprint (CB/57.4 and MB/143.9 acres of segmented offshore break water) would include the elimination of benthic and fishery habitat and would cause the conversion of sandy shallow open water habitats to rock habitat which will only partially be submerged. Additionally 77.1 acres of shallow mud bottom would be converted to rock with the MB components in Freshwater Bayou. There would be a short term direct adverse impact to benthic species as well as the habitat of other aquatic species as 2,441 acres of water bottom is deepened and then refilled for the floatation channels. There could be direct mortality or injury of fisheries and benthic species due to both the digging and relocating of the material and burial of species that have colonized the area during the work. During construction of project features, there would be short-term indirect adverse impacts to plankton, benthic populations and fisheries species due to increases in turbidity, and low dissolved oxygen. Filter feeding species would be impacted due to clogging of the gills which could either cause death or reduce growth and reproduction. Visual predators would have a reduced success rate due to turbidity. Mobile species would attempt to move from the area of influence. Rock substrate is known to



provide benefits to some aquatic species by providing them a refuge from predation. They also provide a hard substrate for oyster spat to settle on. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.

- *Cheniers*: Reforesting chenier ridges would have no direct, indirect, or cumulative impacts.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts are the same as the MB component of the TSP.

3.3.7 Essential Fish Habitat (EFH)

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

No significant impact to these resources is expected. There is a risk that certain methods at certain locations could impact wetland EFH but these method and location combinations would be avoided where practicable.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: Measure #74a in the CB would directly impact water bottom EFH by converting approximately 3 acres into rocky bottom and 0.25 acres of marsh EFH into a rock structure. Rock is not considered EFH in coastal Louisiana. In addition there would be a short term direct adverse impact to water bottom EFH as 104 acres of water bottom is deepened and then refilled for the floatation channels. Over the project life 56 acres of marsh EFH is predicted (Master Plan Model) to be converted into open water/mud bottom EFH due to this measure.
- *Marsh Restoration*: Both the CB and MB components would convert open water (combination of estuarine mud bottoms EFH) to marsh (marsh edge, SAV, marsh ponds, and inner marsh EFH). In addition there would be a short term direct adverse impact to estuarine mud bottoms and oyster reefs EFH as 955 acres of water bottom is deepened and then refilled for the floatation channels. Construction activities using earthen materials to create marsh could bury EFH substrates or temporarily change environmental conditions, including turbidity and salinity, in the water column. The project would increase SAV and adjacent intertidal marsh vegetation (marsh restoration areas) in some areas. The CB components and MB components will nourish existing marsh and terraces. This will be a long term indirect positive impact to marsh (marsh edge, SAV, marsh ponds, and inner marsh EFH). Approximately 9,100 acres are identified for borrow (3,300 acres from Calcasieu Ship Channel, 5,800 acres from the Gulf for the CB). If the dredged material from the ship channel is obtained during maintenance events there would be no additional EFH impacts. Borrow in the Gulf would convert Gulf water EFH to deeper Gulf water EFH. Some offshore borrow areas could refill with material over time. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Shoreline Protection*: Both the CB and MB components would convert open water (combination of estuarine mud bottoms, Gulf waters, marsh edge, offshore, beach, coastal, and sand EFH) to rock which is not considered EFH in coastal Louisiana. In addition there would be a short term direct adverse impact to the aforementioned EFH as 2,441 acres of water bottom is deepened and then refilled for the floatation channels. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Cheniers*: Reforesting chenier ridges would have no direct, indirect, or cumulative impacts on EFH.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts same as the MB component of TSP.

3.3.8 Threatened and Endangered Species, and Other Protected, Species of Concern

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

This alternative would have no effect on the red-cockaded woodpecker (RCW) and minimal indirect impacts on species of concern within the project area. Direct impacts would be avoided in accordance with the Endangered Species Act (ESA), Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty



Act (MBTA) by the use of best management practices (BMPs) (see Appendix A) and recommendations from USFWS. Depending on final designs of the NED TSP, potential minimal indirect impacts could occur to the candidate species, Sprague's pipit. These impacts could include the temporary displacement of any birds that may be present due to construction activity and noise. However, impacts to this species would be avoided, minimized and reduced to the maximum extent practicable and mitigated as necessary.

Species of Concern: Depending on final designs of the NED TSP, there could be a potential for minimal indirect impacts to colonial nesting water birds. These impacts could include the temporary displacement of any birds that may be present due to construction activity and noise. It is assumed the birds would relocate to adjacent foraging/roosting grounds. Nesting birds would not be impacted as no work would take place within a rookery. Additionally, during nesting season, work would be required to take place outside of the USFWS and LDWF-declared buffer zones (Appendix A, Annex K). Work within the buffer zones may only take place during non-nesting season (September 1 to February 15). There would be no impacts to the bald eagle as no known nests are located near any project features. If an eagle's nest is found within the project area, a no-work zone would be implemented (Appendix A, Annex K).

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Based on review of existing data, it is the opinion of CEMVN that implementation of this alternative is not likely to adversely affect the piping plover and piping plover critical habitat, red knot, West Indian manatee, Gulf sturgeon, loggerhead and Kemps Ridley sea turtles; and would have no effect on the green, leatherback, and hawksbill sea turtles or loggerhead critical habitat. Furthermore, direct impacts to species of concern would be avoided in accordance with the BGEPA, MBTA, and the Marine Mammal Protection Act (MMPA) by the use of BMPs (see Appendix A) and recommendations from USFWS and NMFS. All indirect impacts would be avoided, minimized and reduced to the maximum extent practicable and mitigated as necessary. Further consultation would occur as features are implemented if construction has not been conducted within one year of signing the ROD.

- *Hydro/Salinity:* No anticipated impacts to T&E species.
- *Marsh Restoration:* Potential temporary minimal indirect impacts to the piping plover, red knot, West Indian manatee, Gulf sturgeon and all sea turtles identified in Appendix A. Temporary construction related impacts would result from noise, turbulence and the presence of workers in the marsh restoration sites, access routes and borrow sites and would likely result in species avoiding areas temporarily. In addition critical habitat for piping plover will be temporarily impacted by the dredge pipeline coming in from the Gulf where it crosses the beach. Timing of placement and removal will be coordinated with USFWS. Loggerhead critical habitat would not be impacted as the borrow sites are within approximately 3 miles offshore. Beneficial impacts would be the increase in wetland habitat which is utilized by whooping cranes. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Shoreline Protection:* Potential indirect impacts to the West Indian manatee, Gulf sturgeon and all sea turtles listed in Appendix A, Annex K would be temporary and minimal. Temporary construction related impacts would be due to noise, turbulence and mere presence of workers in the marsh restoration sites, access routes and borrow sites and would likely result in the species avoiding the area temporarily. Permanent impacts would be the hindrance of access by sea turtles, to thousands of linear feet of shoreline. However, sea turtles do not typically use the beaches of Louisiana and it is assumed that they could easily go around the breakwater as it would not be contiguous. Loggerhead critical habitat would not be impacted as the shoreline protection features are approximately 150 feet from the shore. Indirect beneficial impacts would be the protection of thousands of linear feet of shoreline which is designated piping plover critical habitat and also used by the red knot. Table 2-18 (Chapter 2) provides a full listing of each feature with quantities.
- *Cheniers:* There could be minimal indirect impacts to Sprague's pipits if reforestation occurs on grasslands. It is assumed that the birds would relocate to adjacent or nearby suitable foraging/roosting area. Table 2-18 (Chapter 2) provides a full listing of feature quantities.

**Species of Concern:**

- Potential for minimal indirect impacts to colonial nesting water birds. Impacts could include disturbance of roosting or foraging birds due to construction activity and noise. It is anticipated nesting birds would not be impacted as no work would take place within a rookery. Additionally, during nesting season, work would be required to take place outside of the USFWS and LDWF declared buffer zones (Appendix A). Work within buffer zones may only take place during non-nesting season (September 1 to February 15). In addition to these potential adverse impacts, marsh restoration would beneficially impact colonial nesting water birds by providing additional foraging grounds.
- No impacts to the bald eagle, as no known nests are located near any project features. If an eagle's nest is found within the project area, a no-work zone must be implemented.
- Bottlenose dolphins could be found in the vicinity of these features, but, by utilizing measures for reducing entrapment of this species found in Appendix A, no indirect impacts are anticipated.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts to T&E resources would be similar to those discussed for the NER TSP except to a lesser extent.

3.3.9 Cultural and Historic Resources

The following alternatives have the potential to impact cultural resources, and CEMVN has determined that cultural resource investigations and consultation would be required prior to implementing the recommended plans in order to assess potential impacts to historic properties. The CEMVN will seek to identify ways to avoid, minimize, and/or mitigate impacts to historic properties and resources of religious and cultural significance to Tribes that have the potential to be impacted by the proposed action. The USACE has elected to fulfill its obligations under Section 106 of the NHPA through the execution and implementation of a Programmatic Agreement as provided in 36 CFR Part 800.14(b). Information provided below is detailed in the draft *Cultural Resources Assessment and Research Design for the Southwest Coastal Louisiana Project, Calcasieu, Cameron, Iberia, Jefferson Davis, and Vermilion Parishes, Louisiana* (Wells and Hill 2015) on file with the Louisiana Division of Archaeology.

HSDRR (NED) PlanAlternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

There is the potential for direct and indirect impacts to previously recorded archaeological sites and standing structures with a minimum age of 50 years, as well as any unrecorded sites and/or standing structures that may be identified during subsequent cultural resource investigations cultural resource investigation.

Approximately 4,952 standing structures located within the 0-25 year flood plain have been identified as candidates for nonstructural measures. It is possible that among the standing structures selected for nonstructural measures there will be structures that are either listed in or eligible for listing in the National Register of Historic Places (NRHP) or have a minimum age of 50 years and have not been assessed for eligibility. Sixteen historic properties have been identified in the study area, including 12 that are listed in the National Register of Historic Places (NRHP).

Ecosystem Restoration (NER) PlansAlternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

CB - There is the potential for direct and indirect impacts to eight previously recorded archaeological sites and 17 standing structures with a minimum age of 50 years that have not been assessed for eligibility, as well as any unrecorded sites and/or standing structures that may be identified during the cultural resource investigation. The previously recorded sites include one that has been determined not eligible for NRHP listing. The remaining seven have not been assessed. Of the eight previously recorded sites, three have prehistoric components, and five have historic components.

- *Hydro/Salinity*: No previously recorded sites or standing structures have been identified within a one-mile buffer of the proposed measure (74a).



- *Marsh Restoration*: One prehistoric site of unknown eligibility has been identified within a one-mile buffer of the proposed measures (3a1, 3c1, 124c, 124d). No previously recorded standing structures have been identified within a one-mile buffer of the measures. No previously recorded sites have been identified within the proposed borrow areas.
- *Shoreline Protection*: One historic site, determined not eligible for listing in the NRHP, has been identified within a one-mile buffer of the measure (5a). Four previously recorded standing structures within the one-mile buffer have a minimum age of 50 years and have not been assessed for eligibility.
- *Cheniers*: Two prehistoric sites and four historic sites have been identified within a one-mile buffer of the measures (510a, 510b, 510d), none of which have been assessed. There are 13 previously recorded standing structures within a one-mile buffer 50 years or older that have not been assessed for eligibility.

MB - There is the potential for direct and indirect impacts to 19 previously recorded archaeological sites and 31 standing structures with a minimum age of 50 years that have not been assessed for eligibility, as well as any unrecorded sites and/or standing structures that may be identified during the cultural resource investigation. The previously recorded sites include one potentially eligible for listing in the NRHP and seven that have been determined not eligible for listing in the NRHP. The remaining 11 have not been assessed. Of the 19 sites, all have prehistoric components, and one has a historic component.

- *Marsh Restoration*: Nine prehistoric sites have been identified within a one-mile buffer of the proposed measures (47a1, 47a2, 47c1, 127c3, 306a1), one of which has been identified as potentially eligible for listing in the NRHP and two that have been determined not eligible for listing in the NRHP. The remaining six have not been assessed. Sixteen standing structures within the one-mile buffer have a minimum age of 50 years and have not been assessed for eligibility. No previously recorded sites have been identified within the proposed borrow areas.
- *Shoreline Protection*: Eight prehistoric sites have been identified within a one-mile buffer of the proposed measures (16b, 6b1, 6b2, 6b3), four of which have been determined not eligible for listing in the NRHP. The remaining four have not been assessed. No previously recorded standing structures have been identified within a one-mile buffer of the proposed measure.
- *Cheniers*: Eleven prehistoric sites, one with a historic component, has been identified within a one-mile buffer of the proposed measures (416, 509c, 509d). One site has been identified as potentially eligible for listing in the NRHP and three have been determined not eligible for listing. The remaining seven have not been assessed. Thirty-one standing structures within the one-mile buffer have a minimum age of 50 years and have not been assessed for eligibility.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts would be the same as those described for the MB component of the TSP.

3.3.10 Aesthetics (Visual Resources)

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

The TSP would have minimal impacts on visual resources. Elevating homes would not impact view sheds into any surrounding areas. In cases where a home or land buyout may take place this could indirectly impact visual resources by removing a viewer from a given area. In areas where there is public access from a street or roadway, these nonstructural elements would not change the view shed. Houses being raised are currently present, their elevation would change, but the site is still occupied either way. In the case of a home buyout, if a home is removed and open land is created, this could be considered as a benefit to drivers looking for natural scenery or a loss to an established neighborhood.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: In terms of technical significance, reducing the residence time of saline water and increasing wetland productivity would most certainly benefit visual resources. In areas influenced by this measure, marshes would improve in quality relative to No Action, better maintaining the texture, color,



and framing elements of the landscape. Greater habitat diversity would be preserved, supporting a greater variety of fauna to areas to serve as focal points of life. In terms of public and institutional significance, the hydro/salinity measures will positively benefit areas in Cameron Parish along the Creole Nature Trail Scenic Byway and All American Road. Projects along LA-27 and LA-82 will be visible to travelers on the scenic byway.

- *Marsh Restoration*: This element would not be all that different from the definitions listed under Hydro/Salinity. The areas of significance, in terms of what Hydro/Salinity goals are meant to achieve, are almost exactly the same as they relate to Visual Resources. The primary difference is in how the marsh is restored. With the use of beneficial use dredge material from CSC, where impacts will be minimal, visual resources will be greatly and positively impacted. Those areas along the Creole Nature Trail will positively impact the byway creating enhanced view sheds for travelers. Other areas, such as those located along the Intracoastal Waterway and Freshwater Bayou have less visual significance because those areas are remote with limited access. Construction of marsh habitat may have temporary negative impact to the Aesthetic resources in the project area. Initial construction of the marsh will temporarily alter open water to bare mud flats, which may be considered aesthetically unpleasant. With dewatering and natural colonization of marsh plants, it will take approximately five years before the marsh becomes established with vegetation.
- *Shoreline Protection*: These elements have public visual significance and their protection and restoration would improve Louisiana's shoreline. Visually, manmade measures like breakwaters would not have positive effects on the viewscape of undeveloped and natural beach. Measures such as this are necessary to ensure that the beach remains as it is. Many of these areas are remote and public access is very limited.
- *Cheniers*: Visually, these features are the most significant of any other in the study area. Cheniers aid in the form and function of developing the design elements of the landscape. As small hillocks or ridges, they offer the variation in terrain that makes the view shed interesting and memorable. They offer islands of oasis for different plant materials to develop and add texture and color to the land. In most cases, they allow taller trees to grow in a region which adds the necessary framing elements to the landscape to give it artistic quality and character. Most of the designated chenier restoration features are located directly adjacent to the Creole Nature Trail and would drastically and positively add to design elements already described under marsh restoration and hydro/salinity.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts would be the same as those described for the MB component of the TSP.

3.3.11 Recreation

HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

A direct impact of acquiring structures is potentially reducing the number of recreational camps. On the other hand, vacated sites would become open space that could be used recreationally. There are no direct impacts from structure elevation on recreational resources. A direct impact from floodproofing park buildings is the recreational use will be temporarily unavailable during floodproofing work. An indirect impact of elevating structures on building costs of future recreational camps could result in fewer camps being constructed.

Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

- *Hydro/Salinity*: Direct impacts include restricting boaters' access to recreational resources in the area during construction activities. By reducing saltwater intrusion into adjacent wetlands, levels of recreational fishing and hunting should be maintained and even improved as wetland acreages increase.
- *Marsh Restoration*: Any direct impacts to recreational fishing, hunting, and other recreational resources would be temporary and occur during construction. Recreationalists may have to circumvent a marsh restoration project area when traveling to a destination due to construction limiting or delaying access. In general, measures that create marsh habitat and improve hydrology of wetlands are more likely to improve recreational fishing opportunities by enhancing the sustainability of productive nursery habitats.



- *Shoreline Protection:* Any direct impacts to recreational fishing and hunting would be temporary and occur during construction activities. Shoreline protection projects should help protect recreational resource lands from effects of coastal storm surge and minimize the loss of valuable fishery habitat.
- *Cheniers:* Restoration of natural ridges would improve bank stabilization and potentially provide additional habitat for deer, small game and birds, which could be beneficial for hunting and bird watching. Restored ridges would also enhance protection of adjacent swamps and marshes during coastal storms, which could also potentially benefit recreational resources and infrastructure such as boat launches.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts would be the same as those described for MB component of the TSP. Appendix A (Annex N: Recreation) provides more details on direct, indirect and cumulative impacts of the TSP and the Mermentau Small Integrated Restoration Alternative on these resources.

3.4 Cumulative Impacts

3.4.1 HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Cumulative impacts are the effects on the environment that result from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from actions that individually are minor, but collectively result in significant actions taking place over time (Section 1508.7 40 CFR Parts 1500-1508). For example, the incremental impacts of emergent wetland restoration at several localized areas could significantly modify an entire basin's habitat diversity. A determination was made utilizing CEQ's 11-step cumulative effects analysis process.

3.4.2 HSDRR (NED) Plans

Alternative - Nonstructural 0-25 Year Floodplain Plan (TSP)

Cumulative impacts would be the incremental direct and indirect effects on each significant resource described above, caused by implementing proposed nonstructural flood risk management measures, including elevating 4,219 residential structures, floodproofing 396 non-residential structures and public buildings, and building berms or floodwalls around 337 warehouses, and acquiring structures that meet eligibility criteria. These incremental impacts would be in addition to the direct and indirect impacts attributable to other existing and authorized for construction non-structural HSDRRS existing and authorized for construction projects throughout the Sabine, Calcasieu, Mermentau, and Teche-Vermilion basins; the State and the Nation. Presently, there are very few large-scale plans that have nonstructural components. However, the National Nonstructural / Flood Proofing Committee (<http://www.nwd-mr.usace.army.mil/rcc/MRFTF/docs/USACE-NFPC%20Nonstructural%20Measures%20Definitions.pdf>; accessed March 12, 2015) provide the following:

Nonstructural flood risk management measures are proven methods and techniques for reducing flood risk and flood damages incurred within floodplains. Thousands of structures across the nation are subject to reduced risk and damages or no risk and no damage due to implementation of nonstructural measures. Besides being very effective for both short and long term flood risk and flood damage reduction, nonstructural measures can be very cost effective when compared to structural measures.

The 2012 Coastal Master Plan recommends a comprehensive nonstructural program as part of our strategy to reduce the flood risk for Louisiana citizens. Nonstructural projects include raising a building's elevation, flood proofing structures, and voluntary acquisition or relocation. These measures are key components of protecting communities through a "multiple lines of defense approach" (<http://coastal.la.gov/project-content/ccrp/>; accessed March 12, 2013).

The impact Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) program (<http://www.fema.gov/hazard-mitigation-assistance>) grants programs provide funding for eligible



mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs:

- [Hazard Mitigation Grant Program \(HMGP\)](#) assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities.
- [Pre-Disaster Mitigation \(PDM\)](#) provides funds for hazard mitigation planning and to implement mitigation projects before disasters. The program goal is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from disaster declarations.
- [Flood Mitigation Assistance \(FMA\)](#) provides annual funds so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP).

3.4.3 Ecosystem Restoration (NER) Plans

Alternative - Comprehensive Small Integrated Restoration Plan (Plan CM-4) (TSP)

Cumulative impacts would primarily relate to the incremental impact of all past, present, and future actions affecting multiple resources. The incremental effects of the project would enhance aquatic resources when combined with other Federal, state, local, and private restoration efforts. Cumulative impacts would be the incremental direct and indirect effects on each significant resource described above of positively influencing over 6,000 acres of wetlands impacted by saltwater intrusion and inundation via hydrology/salinity control structures; restoring and nourishing over 12,500 acres of brackish and saline marshes; protecting over 5,500 acres (over 250,000 linear feet) of shoreline; and reforesting over 1,400 acres of forested chenier habitat. Incremental effects would be in addition to the direct and indirect effects of other ecosystem restoration efforts in the Sabine, Calcasieu, Mermentau, and Teche-Vermilion basins; the State and other ongoing and completed ecosystem restoration projects, including:

- CWPPRA program - 151 restoration/protection projects benefiting over 110,000 acres.
- LCA Program - the USACE and the State will continue the Mississippi River Hydro/Delta Management Feasibility Study. The State has declined to participate in the LCA BUDMAT program; however, other non-federal cost share sponsors are interested.
- The 2012 State Master Plan (CPRA 2012) - evaluated 248 restoration projects, 33 structural and 116 conceptual nonstructural flood risk reduction projects. Each project has its own timeline and budget.
- There are various other restoration programs, including those using funds from the 2010 BP oil spill.
- The EPA, reporting on the Nation, states the number of restoration projects grows yearly. Current Federal initiatives call for a wide range of restoration actions, including improving or restoring 25,000 miles of stream corridor; achieving a net increase of 100,000 acres of wetlands each year (source: <http://water.epa.gov/type/wetlands/restore/principles.cfm>; accessed March 12, 2015). Some other large scale ecosystem restoration projects include Chesapeake Bay, the Everglades, California Bay Delta, the Platte River Basin and the Upper Mississippi River System (Doyle and Drew 2008).

Cumulative impacts would include the incremental impacts of the proposed action on visual resources of acres of marsh, wetland, and chenier ridge in the project area and other areas throughout the basin, Louisiana, and the Nation being converted or restored from open water back to land mass. Replenishment of the land would convert existing view sheds of open water into marsh, wetland, or a variety of landscape types that frame large bodies of open water and use the basic design elements of form, line, texture, color, and repetition to create an aesthetically pleasing view shed.

Similar projects across Southern Louisiana (which include Louisiana coastal restoration projects) include a number of diversion projects, marsh, and swamp restoration and nourishment, and shoreline protection; CWPPRA projects that include diversions, marsh restoration, shoreline protection, and siphons; lock replacement projects; and operation and maintenance projects, like that found at Bonnet Carre' Spillway. Other similar projects can be found throughout the nation as both public and private responsibilities. Past, present, and future projects of this type are necessary to both maintain existing marsh levels and build up future levels, thereby diminishing open water areas and creating land mass.



Other Gulf shore protection and restoration projects have been constructed along the Gulf shoreline through other funding sources. Segmented breakwaters have been constructed under at least two separate projects to the west of the proposed Holly Beach Shoreline Stabilization (5a) measure. The proposed breakwater would provide shoreline protection from the eastern end of the existing breakwaters eastward to the Calcasieu Pass jetty and compliment that existing project. The shoreline where the proposed Holly Beach measure would be built has been nourished with material dredged from the bottom of the Gulf of Mexico to help ensure that shoreline erosion did not compromise Louisiana Highways 27/82. Rock and rip/rap has also been placed at critical locations where shoreline erosion has threatened the highway. The proposed Holly Beach measure is compatible with and would augment these prior efforts. There have been proposals to construct shore protection measures along the Gulf where the proposed Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou (6b1, 6b2, and 6b3) measures are located, but no projects have been built.

Recreation: Temporary negative impacts of restoration activities due to construction activities, increased turbidity and possible boating access issues are mediated by the presence of other productive and popular recreation areas throughout the coastal region of Louisiana. Long-term positive cumulative impacts are expected to occur as restorations measures help protect recreational resource lands from effects of coastal storm surge while improving recreational opportunities by enhancing the sustainability of valuable nursery habitats.

Alternative – Mermentau Small Integrated Restoration Plan (Plan M4)

Impacts would be the same as described for the Mermentau Basin component of the TSP.

3.5 Relationship between Local Short-Term uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

NEPA Section 102(2)(c)(iv) and 40 CFR 1502.16 requires that an EIS include a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This section describes how the TSP would affect the short-term use and the long-term productivity of the environment. For the TSP, “short-term” refers to the temporary phase of construction of the proposed project, while “long-term” refers to the operational life of the proposed project and beyond.

The NER TSP would result in short-term construction-related impacts within parts of the project area and would include to some extent interference with local traffic, minor limited air emissions, and increases in ambient noise levels, disturbance of fisheries and wildlife, increased turbidity levels, lower dissolved oxygen, and disturbance of recreational and commercial fisheries. These impacts would be temporary and would occur only during construction, and are not expected to alter the long-term productivity of the natural environment.

The NER TSP would assist the long-term productivity of the ecological community in three basins by improving water quality, nutrients, and sediments. This would facilitate the growth and productivity of marsh and the invertebrates, fish, and wildlife that use marsh. The NER TSP would enhance the long-term productivity of natural communities throughout the region. These long-term beneficial effects would outweigh the environmental impacts resulting primarily from project construction. The quantity and quality of wetland habitat and fish populations would benefit. These improvements in productivity would beneficially impact long-term commercial and recreational fishing in the study region.

3.6 Mitigation

Mitigation measures avoid, minimize, or compensate for adverse impacts to environmental resources. The appropriate application of mitigation is to formulate a project that first avoids adverse impacts, then minimizes adverse impacts, and lastly, compensates for unavoidable impacts. The impacts described here for the NED plan are programmatic in nature. Subsequent NEPA documents would evaluate the need for mitigation on site specific NED project(s) impacts before implementation. At this point, no impacts from the NER plan have been identified that would require compensatory mitigation. In addition, no wildlife



mitigation would be required at this time. Direct impacts would be avoided in accordance with the ESA, MMPA, BGEPA, and the MBTA by the use of BMP (see Appendix A) and recommendations from USFWS and NMFS. Depending on final designs, potential minimal indirect impacts could occur to the candidate species, Sprague's pipit, and direct impact to critical habitat for piping plover. To reduce fisheries impacts any clearing and snagging would adhere to the Stream Obstruction and Removal Guidelines (1983). Air quality and noise impacts can be reduced by using heavy machinery fitted with approved muffling devices that reduce noise, vibration, and emissions. A cultural resource monitoring program is recommended during implementation. Monitoring would consist of having a qualified archaeologist present during the clearing and snagging process. The purpose of the monitoring is to assure that no previously known or unknown archaeological sites are impacted during the work.